

# EXERCISES

For more practice, see *Extra Practice*.

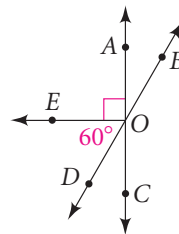
## Practice and Problem Solving

### A Practice by Example

#### Example 1 (page 97)

Name an angle or angles in the diagram described by each of the following.

1. supplementary to  $\angle AOD$
2. adjacent and congruent to  $\angle AOE$
3. supplementary to  $\angle EOA$
4. complementary to  $\angle EOD$
5. a pair of vertical angles



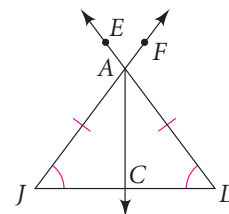
In the diagram above, find the measure of each of the following angles.

6.  $\angle EOC$
7.  $\angle DOC$
8.  $\angle BOC$
9.  $\angle AOB$

#### Example 2 (page 97)

Can you make each conclusion from the information in the diagram? Explain.

10.  $\angle J \cong \angle D$
11.  $\angle JAC \cong \angle DAC$
12.  $\angle JAE$  and  $\angle EAF$  are adjacent and supplementary.
13.  $m\angle JCA = m\angle DCA$
14.  $m\angle JCA + m\angle ACD = 180$
15.  $\overline{AJ} \cong \overline{AD}$
16.  $C$  is the midpoint of  $\overline{JD}$ .
17.  $\angle EAF$  and  $\angle JAD$  are vertical angles.
18.  $\overrightarrow{AC}$  bisects  $\angle JAD$ .



#### Example 3 (page 98)

19. **Developing Proof** Complete this proof of one form of Theorem 2-3 by filling in the blanks.

If two angles are complements of the same angle, then the two angles are congruent.

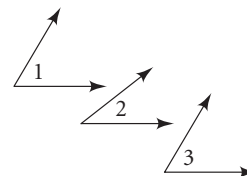
**Given:**  $\angle 1$  and  $\angle 2$  are complementary.  
 $\angle 3$  and  $\angle 2$  are complementary.

**Prove:**  $\angle 1 \cong \angle 3$

**Proof:** By the definition of complementary angles,  
 $m\angle 1 + m\angle 2 = \mathbf{a. \text{ ? }}$  and  $m\angle 3 + m\angle 2 = \mathbf{b. \text{ ? }}$ .

Then  $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$  by **c. ?**.

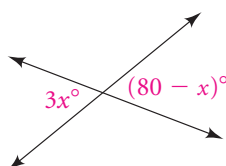
Subtract  $m\angle 2$  from each side. You get  $m\angle 1 = \mathbf{d. \text{ ? }}$ .



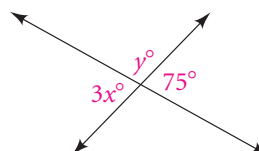
#### Example 4 Algebra Find the value of each variable.

(page 99)

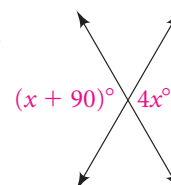
20.



21.



22.



Find the measures of the labeled angles in each exercise.

23. Exercise 20

24. Exercise 21

25. Exercise 22

**B Apply Your Skills**



**26. Writing** How is a theorem different from a postulate?

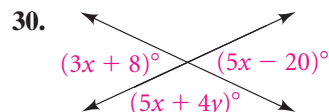
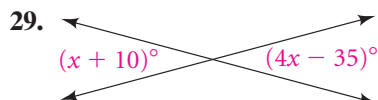
**27. Open-Ended** Give an example of vertical angles in your home.

**28. Reasoning** Explain why this statement is true:

If  $m\angle 1 + m\angle 2 = 180$  and  $m\angle 3 + m\angle 2 = 180$ , then  $\angle 1 \cong \angle 3$ .



**Algebra** Find the value of each variable and the measure of each labeled angle.



**31. Developing Proof** Complete this proof of Theorem 2-4 by filling in the blanks.

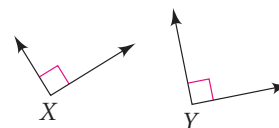
All right angles are congruent.

**Given:**  $\angle X$  and  $\angle Y$  are right angles.

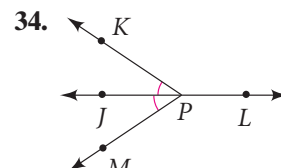
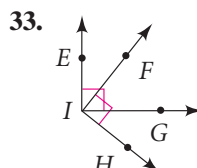
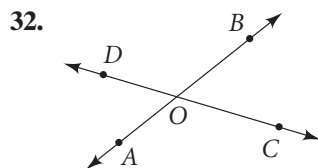
**Prove:**  $\angle X \cong \angle Y$

**Proof:** By the definition of a. ?,  $m\angle X = 90$  and  $m\angle Y = 90$ .

By the Substitution Property,  $m\angle X =$  b. ?, or  $\angle X \cong \angle Y$ .



Name two pairs of congruent angles in each figure. Justify your answers.



**35. Developing Proof** Complete this proof of Theorem 2-5 by filling in the blanks.

If two angles are congruent and supplementary,  
then each is a right angle.

**Given:**  $\angle W$  and  $\angle V$  are congruent  
and supplementary.

**Prove:**  $\angle W$  and  $\angle V$  are right angles.

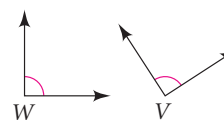
**Proof:**  $\angle W$  and  $\angle V$  are congruent, so  $m\angle W = m\angle$  a. ?.

$\angle W$  and  $\angle V$  are supplementary so  $m\angle W + m\angle V =$  b. ?.

Substituting  $m\angle W$  for  $m\angle V$ , you get  $m\angle W + m\angle W = 180$ , or  $2m\angle W = 180$ .

By the c. ? Property of Equality,  $m\angle W = 90$ .

Since  $\angle W \cong \angle V$ ,  $m\angle V = 90$ , too. Then both angles are d. ? angles.



**36. Design** The two back legs of the director's chair pictured at the left meet in a  $72^\circ$  angle. Find the measure of each angle formed by the two back legs.

**37. Coordinate Geometry**  $\angle AOX$  contains points  $A(1, 3)$ ,  $O(0, 0)$ , and  $X(4, 0)$ .

a. Find the coordinates of a point  $B$  so that  $\angle BOA$  and  $\angle AOX$  are adjacent complementary angles.

b. Find the coordinates of a point  $C$  so that  $\overrightarrow{OC}$  is a side of a different angle that is adjacent and complementary to  $\angle AOX$ .

**38. Coordinate Geometry**  $\angle DOE$  contains points  $D(2, 3)$ ,  $O(0, 0)$ , and  $E(5, 1)$ .

Find the coordinates of a point  $F$  so that  $\overrightarrow{OF}$  is a side of an angle that is adjacent and supplementary to  $\angle DOE$ .

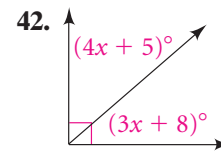
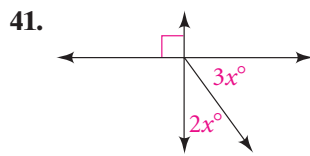
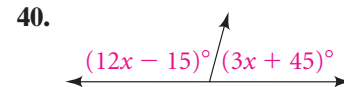
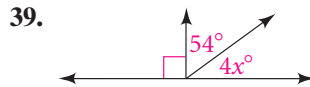


Exercise 36



Exercise 43

**x<sup>2</sup> Algebra** Find the value of each variable and the measure of each labeled angle.



**Sports** In the photograph, the wheels of the racing wheelchair are tilted so that  $\angle 1 \cong \angle 2$ . What theorem can you use to justify the statement  $\angle 3 \cong \angle 4$ ?

**Critical Thinking** If possible, find the measures of the angles described. If it is not possible, explain why.

44. congruent adjacent supplementary angles
45. congruent adjacent complementary angles
46. congruent vertical angles

**x<sup>2</sup> Algebra** Find the measure of each angle.

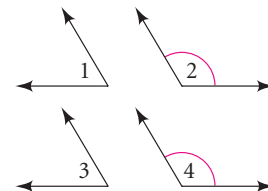
47.  $\angle A$  and  $\angle B$  are complementary.  $m\angle A = 3x + 12$  and  $m\angle B = 2x - 22$ .
48.  $\angle A$  and  $\angle B$  are supplementary.  $m\angle A = 3x + 12$  and  $m\angle B = 2x - 22$ .
49.  $\angle A$  is twice as large as its complement,  $\angle B$ .
50.  $\angle A$  is half as large as its complement,  $\angle B$ .
51.  $\angle A$  is twice as large as its supplement,  $\angle B$ .
52.  $\angle A$  is half as large as twice its supplement,  $\angle B$ .
53. The measure of  $\angle B$ , the supplement of  $\angle A$ , is four times the measure of  $\angle C$ , the complement of  $\angle A$ .
54. The measure of  $\angle B$ , the complement of  $\angle A$ , is one-sixth the measure of  $\angle C$ , the supplement of  $\angle A$ .

**Challenge Proof** 55. Write a paragraph proof for this form of Theorem 2-2.

If two angles are supplements of congruent angles, then the two angles are congruent.

**Given:**  $\angle 1$  and  $\angle 2$  are supplementary.  
 $\angle 3$  and  $\angle 4$  are supplementary.  
 $\angle 2 \cong \angle 4$

**Prove:**  $\angle 1 \cong \angle 3$

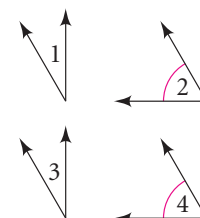


**Proof** 56. Write a paragraph proof for this form of Theorem 2-3.

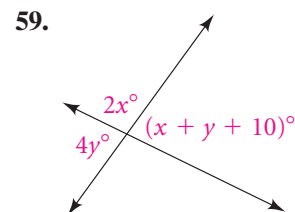
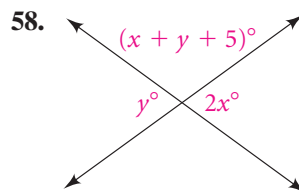
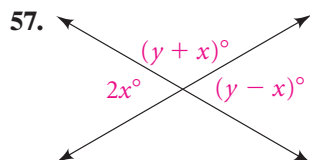
If two angles are complements of congruent angles, then the two angles are congruent.

**Given:**  $\angle 1$  and  $\angle 2$  are complementary.  
 $\angle 3$  and  $\angle 4$  are complementary.  
 $\angle 2 \cong \angle 4$

**Prove:**  $\angle 1 \cong \angle 3$



**$x^2$  Algebra** Find the value of each variable and the measure of each labeled angle.



## Standardized Test Prep

### Gridded Response

Find the measure of each angle.

60. an angle with measure 8 less than the measure of its complement

61. one angle of a pair of complementary vertical angles

62. an angle with measure three times the measure of its supplement



### Take It to the NET

Online lesson quiz at

[www.PHSchool.com](http://www.PHSchool.com)

Web Code: afa-0205

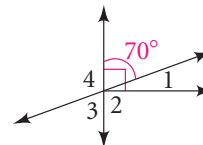
Use the diagram at the right to find the measure of each of the following angles.

63.  $\angle 1$

64.  $\angle 2$

65.  $\angle 3$

66.  $\angle 4$



## Mixed Review

### Lesson 2-4

Use the given property to complete each statement.

67. Subtraction Property of Equality

If  $3x + 7 = 19$ , then  $3x = \underline{\quad? \quad}$ .

68. Reflexive Property of Congruence

$\overline{AB} \cong \underline{\quad? \quad}$

69. Substitution Property

If  $MN = 3$  and  $MN + NP = 15$ , then  $\underline{\quad? \quad}$ .

### Lesson 2-3

Use deductive reasoning to draw a conclusion. If not possible, write *not possible*.

70. If two lines intersect, then they are coplanar.

Lines  $m$  and  $n$  are coplanar.

71. If two angles are vertical angles, then they are congruent.

$\angle 1$  and  $\angle 2$  are vertical angles.

### Lesson 2-2

Each conditional statement below is true. Write its converse. If the converse is also true, combine the statements as a biconditional.

72. If  $y + 7 = 32$ , then  $y = 25$ .

73. If you live in Australia, then you live south of the equator.

74. If  $n > 0$ , then  $n^2 > 0$ .